With the author's compliments

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 2.] [1914.

THE GENUS ATICHIA.

A. D. Cotton.

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IX.—THE GENUS ATICHIA.

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Introduction.

During the early part of last winter an interesting organism was forwarded to Kew from Dominica by Dr. Francis Watts, Commissioner of Agriculture for the West Indies. The plant proved to be a new species of *Atichia*, a genus of fungi of obscure affinity, and until recently but imperfectly known. As species of *Atichia* have never before been received at Kew for examination, it has been thought advisable to give an account not only of the West Indian plant, but also of the genus as a whole, together with a conspectus of the known species.

The specimens forwarded to Kew were found by Mr. J. Jones, Curator of the Botanic Station, on a plantation of limes at Senhouse Estate, Dominica, and sent to Mr. F. W. South, at that time Mycologist in the Imperial Department of Agriculture for the West Indies. The organism occurred on the upper side of the lime leaves, and appeared as small black star-shaped bodies 4–5 mm. in diameter (Fig. 1). The leaves themselves were infected with the scale *Lepidosaphes beckii*, and as the fungus was usually attached to the latter it was thought that it might possibly be parasitic. Several other fungi were present on the leaves forwarded, some of which were connected with the scale insect others not, but all, with the exception of the organism mentioned above, were referable to well-known fungus genera. The star-shaped bodies resembled a lichen such as *Collema* in appearance, being gelatinous and swelling when moistened after the manner of species of that genus. In structure, however, they showed a resemblance to certain members of the Red Algae (*Florideae*) being composed of branched moniliform filaments more or less

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held together in mucilage, loosely arranged in the centre and more compact towards the periphery. The general structure was utterly unlike that of an ordinary fungus, and from an alga the plant differed in the fact that the filaments were apparently devoid of colouring matter, whilst from a lichen they were equally distinct through the absence of gonidia—the algal cells characteristic of that group. As no bodies which could be definitely referred to spores were present, the organism was set aside until fertile specimens should be obtained, and a request was forwarded to Dr. Watts asking for further material and for information on the colour of the cell-contents when fresh.

Additional supplies were subsequently received from Mr. J. Jones, Curator of the Botanic Station, Dominica, and through the Commissioner of Agriculture, and these gave the necessary clue for identification. One of these samples provided the conidia-like spores, and the other abundance of asci and ascospores. The presence of asci proved that the plant was not an alga, and, the absence of gonidia being confirmed, its place had to be sought amongst the fungi. Here it was ultimately traced to the genus *Atichia*, which, on account of its having been originally described as a lichen, had been omitted from Saccardo's *Sylloge Fungorum*. For half a century the genus had contained but a single minute species *A. glomerulosa*, but during recent years several others had been added, an account of which is given below.

History of the Genus.

The genus *Atichia* was founded by Flotow in 1850 for the reception of *Collema glomerulosum*, Ach., a gelatinous plant which occurs as wart-like masses 1–2 mm. in diameter on leaves of conifers in Southern Europe. Flotow noted its peculiar structure and the entire absence of green colour in the tissues, but states he had no hesitation in leaving it in the lichen family *Collemaceae*. He named it *A. Mosigii*, not *A. glomerulosa* as has been assumed by subsequent writers. In 1870 (Brit. Mus. copy) Millardet, in a memoir on the *Collemaceae*, gave a full account of the structure of this plant, illustrated with beautiful figures. He employs here Flotow's name *A. Mosigii* though he had previously referred to it as *Hyphodictyon lichenoides* (gen. et sp. nov.). Millardet also described reproductive bodies which he termed conidia. From that date till 1900 nothing appears to have been added to our knowledge of the genus though several poorly described fungi which had been referred to various groups are now known to represent species of *Atichia*. Saccardo omitted the genus altogether from his *Sylloge*, but in Rabenhorst's *Cryptogamen Flora* it is placed by Rehm as a genus of doubtful position in an appendix to the *Bulgariaceae* (iii., p. 500). The first writer who rejected the plant as a lichen was Millardet, and Stein was the author who proposed the combination *Atichia glomerulosa* (Cohn, Cryptogamen Flora von Schliessen, ii. p. 356, 1879).

Ascospores were first found in a species discovered in Java, material being collected by Count Solms-Laubach, and shortly after by Raciborski. A note on Solms' specimens was given by R. Wagner ('00), who remarks that the plant is an Ascomycete pos-

sessing the peculiar structure of *Atichia*. He names it *Atichiopsis Solmsii*, preferring not to link it more closely with Flotow's genus. The full description promised was not published. A few months previous to this, Raciborski, in the third instalment of his notices on Javan fungi, includes a brief account of *A. Millardeti*, sp. nov. ('00, p. 41). He states that the fungus is common in Java on various hosts, and describes the asci, which contained two-celled coloured spores, as occurring in a layer under the surface of special swollen portions of the thallus. His account, though brief, is more detailed than Wagner's, and it was followed some years later by a full description ('09, p. 369). The general structure of the fungus agreed so exactly with *Atichia glomerulosa* that there was no reason to regard it as generically distinct. According to von Höhnel, Wagner's plant is the same as Raciborski's but his name *Atichiopsis Solmsii* a *nomen nudum*, hence, he states, *A. Millardeti* has priority. Apart, however, from this point, Raciborski's name must stand in preference to Wagner's as it antedates his by a few weeks.*

With the exception of von Höhnel's paper to be noted immediately the other contributions to our knowledge of the genus have been made by French botanists, who have dealt with it under the name *Seuratia*. This genus was proposed by Patouillard in 1904 for a plant obtained by Seurat in Gambier Islands (Polynesia), and a single species, *S. coffeicola*, was first described. As explained later, this plant is the same as *A. Millardeti*, Rac. *Seuratia* was placed by Patouillard amongst the *Capnodiaceae*, though he notes that it differs from the other genera in several particulars, namely, in the absence of superficial mycelium, the gelatinous consistency, and the peculiar dehiscence. In 1905, however, Vuilleman made it the type of a new family, and at the same time described *S. pinicola* sp. nov. on *Pinus halepensis* in the South of France. This plant is obviously, as von Höhnel remarks, the ascigerous stage of the original *A. glomerulosa*. The following year Patouillard described another species, from Tahiti, *S. Vanillae*, on leaves of *Vanilla planifolia* ('06). Von Höhnel's useful paper appeared four years later, though it was preceded by a note in his *Fragmente* ('09, no. 333). In the paper he summarises previous work, points out the identity of *Seuratia* with *Atichia*, and describes *A. Treubii* sp. nov. from material collected by himself in Buitenzorg. Von Höhnel also removes the Hyphomycete *Heterobotrys paradoxa*, Sacc., to the present genus, and, though he did not apparently see the specimen, proposed the new species *A. paradoxa*.

The latest contribution to the subject is by Mangin and Patouillard ('12), who give for the first time a full and illustrated account of the several reproductive bodies. These authors retain the genus *Seuratia* Pat., but remove the plant previously described by one of them as *S. Vanillae* to a new genus *Phycopsis*, on account of the very distinct manner in which the clusters of conidial cells are produced. They also describe the new species *A. Tonduzi*.

* Raciborski's paper, Parasitische Algen und Pilze Javas iii., was received at Kew in July, whereas Wagner's note appeared in the August number of the Oestr. Bot. Zeit.

During recent years Saccardo has included these plants in his *Sylloge*, listing first Patouillard's species *Seuratia coffeicola* (= *A. Millardeti*, Rac.) in the supplement which appeared in 1905 (vol. xvii. p. 558). Subsequently he adopted the name *Atichia*, and in a later supplement (vol. xxii. p. 769, Aug. 1913) he records under that name all species which had appeared up to 1910.

Structure.

The structure of the *Atichia* thallus agrees in a general way with that described for the Dominica plant. The thallus itself is either an irregular wart-like or coralloid mass, or a flattened more or less stellately branched body attached below by a small central point. It is composed of a system of torulose almost articulated filaments held together in mucilage. The filaments branch irregularly and probably anastomose; towards the periphery the branching is dichotomous and the cells smaller and more closely packed, so that a denser cortical layer results. These terminal cells are not, however, laterally united, but remain free as in such an alga as *Nemastoma*. The mucilage is derived from the outer layers of the cell-wall, and the amount present varies considerably in different specimens, being most abundant in old plants. The thallus is colourless within, but externally it is black, owing largely to the peripheral cells being dark in colour.

Three kinds of reproductive organs are known, ascospores, conidia-like cells which adhere in clusters, and pycnidia. With regard to the asci, no definite apothecia or perithecia are produced, but any part of the upper surface of the thallus may become fertile and develop asci between the moniliform filaments in the cortical layer. In some species the fertile portion is swollen in the form of cushion-like pads, which in extreme cases may almost amount to discoid branches. The asci are oval and contain two-celled hyaline or subhyaline spores.* The conidial type of reproduction is even more unusual than the ascigerous. The spores do not occur singly but in clusters, each of which remains intact on liberation, and are produced in great quantities in cavities in the thallus. Mangin and Patouillard, who have carefully worked out the development, term these cell-clusters "propagula," and compare them with the soredia of lichens. There is little doubt that they represent a very abnormal form of conidial development. The propagula themselves are produced in dense masses in the circular or elongated cavities, and are well illustrated in Mangin and Patouillard's paper ('12, Fig. 1). The development of the cells composing the propagulum is remarkable, and consists of successive budding in certain definite directions. The whole thus assumes a characteristic form, which is sufficiently well marked in the different species to afford good specific characters. The genus *Phycopsis*, formed for the reception of *Seuratia Vanillae*, differs

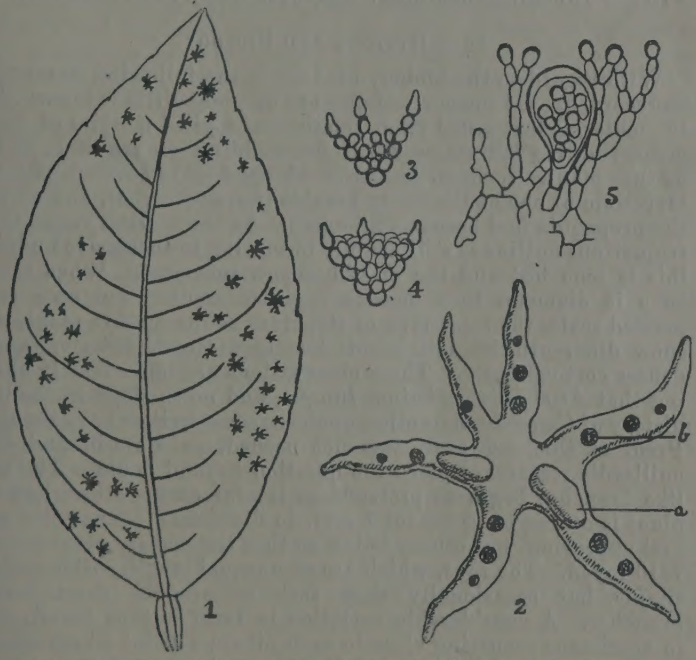
* Raciborski states ('00, p. 41) that the spores of his species are brown, and later ('09, p. 370) that they are (merely) brown-walled ("hellbraunwandig"). An examination of the type-specimens kindly forwarded to Kew by Prof. Raciborski shows that when still in the ascus the spores are practically hyaline, though it is possible that if examined on the spot after natural dehiscence they may be brown-walled.

in the propagula occurring in an isolated manner instead of in dense aggregations. Pycnidia have been described by the above mentioned French authors for *A. Millardeti*. These are found scattered in the thallus on both ascigerous and conidia-bearing plants, and do not show any structural peculiarity.

For specific distinctions the form and size of the thallus have to be noted, but more especially the distribution of the propagula and the arrangement of their component cells. The ascospores vary slightly in size, but otherwise they are singularly constant.

The Dominica Plant.

On close examination the West Indian specimens were found to be distinct from all species previously described. Though in habit and general appearance they very closely resemble both *A. Millardeti* and *A. Tonduzi*, they differ in the form and arrangement of the propagula. In the former these bodies are produced in oval or elongated cavities, and are triquetrous with terminal hairs; in the latter the cavities are circular and the propagula are irregular or botryoidal in form. The Dominica plant possesses



1. Leaf of *Citrus Medica* with *Atichia dominicana* nat. size.
2. Plant of *A. dominicana* showing irregular swellings containing asci *a*, and conidial cavities *b* × 15.
3. Young propagulum showing the budding off of cells from the 3 primary branches × 400.
4. Mature propagulum × 400.
5. Section through thallus showing peripheral filaments and an ascus × 400.

small round receptacles (Fig. 2) with triquetrous propagula devoid of hairs (Figs. 3 and 4). It had therefore to be described as a new species of which the following is the diagnosis:—

A. dominicana, *Cotton;* ab *A. Tonduzo,* Mang. et. Pat., triquetris propagulis differt.

Thallus gelatinosus, nigricans, applanatus, stellato-ramosus, contextu ex filamentis torulosis muco immersis constituto, articulis hyalinis ovoideis vel pyriformibus 5–10 μ longis, ultimis fuliginosis minoribus globosis. Rami horizontales, patentes, simplices aut furcati, teretes, fertiles inflato-nodulosi. Asci sub superficie dispositi, in ramis normalibus aut intumescentibus propriis evoluti, 45–50×25–28 μ, sporis hyalinis bicellularibus ovoideis utrinque rotundatis medio constrictis 17–20×8–10 μ. Propagula (conidia in gregos collecta) in corbulis rotundis facie superiore thalli evoluta, triquetra 20–30 μ longa, ex cellulis ovalis 5–6×4 μ composita, absque pila.

Hab. In foliis *Citri Medicae,* saepe ad scutellis *Lepidosaphis beckii.*

West Indies. Dominica: Senhouse Estate, *J. Jones* 139.

Life-History and Biology.

With regard to the biology of *Atichia* the following items may be recorded. Of the early stages of the plant little is known, but the material forwarded from Dominica supplied a series of specimens showing all stages from the budding propagulum to the mature plant. Some of the leaves received were covered with the mycelium of one of the Sooty Moulds (*Capnodiaceae*), and on this the propagula had become entangled. In the earliest stages their triquetrous outline is still visible, but owing to successive budding this is soon lost and the mass becomes spherical. When about 50 μ in diameter these masses begin to assume, but on a compressed scale, the same type of structure as the mature plant, and show differentiation into a soft loosely arranged interior, and a denser cortical layer. These observations are important in showing that *Atichia* is a distinct fungus, and not a stage in the life-history of *Capnodium* or other genus as some writers have thought. Proof of this, however, was not needed, as Mangin and Patouillard's researches place the question beyond doubt. The ray-like branches begin to protrude as lateral outgrowths when the plant is quite young (about 1 mm. in diameter), four or five rays first appearing, but others follow so that the mature plant may be 7–10 rayed. The rays, which are of unequal length, often remain simple, but occasionally they fork or produce short lateral branches. A considerable variation in form is thus found, even in specimens occurring close to each other; a point which should inculcate caution with regard to the use of external form in this genus. An even greater variation appears to be displayed by *A. Millardeti* and *A. Tonduzi.*

From what has been said it will be seen that there is no necessary connection between the fungus *A. dominicana* and the scale *Lepidosaphes beckii,* though as a fact it is often found attached to the latter. Some of the lime leaves forwarded were very badly

attacked by this pest, and the effect is seen in the presence of sooty moulds and other fungi. The leaves of Raciborski's specimens are quite clean, and the fungus is sparsely scattered and attached directly to the leaf. The same is also true of some specimens of *A. dominicana*, this being particularly the case in the second batch forwarded.

Raciborski notes an interesting point with regard to the production of spores in *A. Millardeti* ('09 p. 370). He states that the formation of asci appears to coincide with the advent of the East monsoon, whilst during the West monsoon conidia are produced. Evidence of such periodicity is to be seen in the West Indian material. The first batch forwarded (collected November, 1912) was either sterile or contained conidia only; the second gathering (collected in February, 1913) possessed conidia in abundance; whilst in the third supply (collected March 15, 1913), almost every specimen is in full ascigerous fruit, though old conidial cavities are also visible. Seasonal development of spores was also noted by Neger in the plant he examined in Chile (see later).

Systematic and Critical.

As far as fungi that have been described under the name of *Atichia* and *Seuratia* are concerned little revision is necessary, but in order to make the survey of the family as complete as possible, other plants which have been detected as possibly representing species of *Atichia* are considered below, and in most cases the original material has been obtained and examined.

With regard to the plants described by French authors, *Phycopsis Vanillae* is undoubtedly a very marked species and well worthy of the generic rank assigned to it by Mangin et Patouillard. *Seuratia Tonduzi*, specimens of which were kindly sent by Prof. Mangin, is distinct in its large size and botryoidal propagula, but on the grounds of priority it should be known as *Atichia Tonduzi*. The identity of *S. coffeicola*, Pat. with *A. Millardeti*, Rac. had been proved by von Höhnel, who examined type specimens of both species, but with the publication of fuller details (Mangin and Patouillard, '12) a few points arose which required re-investigation. Prof. Raciborski kindly forwarded a portion of his original material, the examination of which placed the identity of the two plants beyond dispute, the detailed drawings of the French authors agreeing in every particular with the Javan plant.

Various *Hyphomycetes* were next examined. Von Höhnel pointed out the possibility of *Torula Lechleriana* being a member of the genus, and also *Heterobotrys paradoxa*. In response to a request Prof. P. A. Saccardo was kind enough to send the original specimens on loan to Kew, and also *H. paradoxa* subsp. *chilensis* Sacc. and Syd. The examination of these gave the following results:—

Torula Lechleriana, Sacc. Not an *Atichia*, but apparently rightly placed by Saccardo in the genus *Torula*.

Heterobotrys paradoxa, Sacc. In Sylloge xxii. p. 769, Saccardo suggests that this plant is a synonym of *A. Tonduzi*, whereas von Höhnel had proposed the name *A. paradoxa* sp. nov. ('10, p. 27). The type shows that it is an *Atichia* and closely allied to *A. glome-*

rulosa. The host-plant, however, is *Euonymus japonicus* and not a conifer, and the material very scanty; hence until collected again and further examined it seems advisable to leave the plant as *A. paradoxa*.

H. paradoxa, subsp. *chilensis*, Sacc. and Syd. The type of this shows a typical *Atichia* structure, but the plant is distinct from *A. paradoxa* in its stellate form. It is allied to *A. Tonduzi*, Mang. et Pat., but differs in the much smaller propagula, which are roughly spherical and measure 14–17 μ diameter. It is apparently distinct from all other species, and may be named *A. chilensis*, sp. nov. The fungus described by Neger ('06) as being a stage in the life-history of *Antennaria scoriadea*, and alluded to by von Höhnel, must be referred to here. The description of the gelatinous star-shaped bodies, and of the clusters of spores comparable to those of *Coniothecium* was strongly suggestive of the present genus. Prof. Neger favoured Kew with the loan of authentic material, and from this it is evident that the plant is not *A. chilensis*, as might have been supposed, but a distinct and probably new species having the habit of *A. glomerulosa* but with different and larger propagula. The propagula are very scarce in the material forwarded, and insufficiently developed for a more definite statement to be made.

Two other fungi, or rather two other forms in the so-called life-history of certain species, should likewise be placed in *Atichia*. The species of *Capnodium* described by Bernard ('07) have been the subject of comment by more than one writer. Thus Vuilleman (*Comptes rendus*, t. 146, p. 307), rightly points out that certain fungi described by him as stages in *Capnodium stellatum*, Bern., and *C. javanicum*, Zimm., are entities, and clearly represent *Seuratia*. The type specimens of these two plants are at Buitenzorg and have not been examined. Being Javan plants one would be inclined to refer them to *A. Millardeti*, which Raciborski states is a frequent epiphyte in that region, but the propagula suggest rather *A. Tonduzi*, though they do not entirely agree with that species. These two plants must be left for future enquiry, as from the description and figures it is not possible to determine their specific identity.

Saccardo's suggestion (*Syll.* xxii. p. 769), that his genus *Actinonomma* may possibly find a place here has not been investigated, as the Kew specimens are insufficient for the purpose; but the presence of numerous hairs on the thallus is not in agreement with the plants we have been considering, and indicates a different affinity. This concludes the survey of the *Atichia*-like fungi. It is possible that other species or spore-forms which have been described will ultimately be found to belong to the present genus, but the above includes all those that have so far been detected.

With regard to the position of the genus great difference of opinion has existed. After its removal from the *Collemaceae* it was placed in a special family next to the *Myriangiaceae* by Raciborski, in the *Capnodiaceae* by Patouillard, in the *Saccharomycetes* by von Höhnel, whilst Vuilleman regarded it as the type of a distinct family in the *Perisporiales*. Though not closely allied to any other family this is perhaps the most convenient position

in which to place it, but the name *Atichiaceae* rather than *Seuratiaceae* should be adopted. It is sharply defined by the gelatinous thallus, by the absence of ordinary mycelium and true apothecia, and by the remarkable propagula. Mangin and Patouillard are of opinion that the absence of mycelium is sufficiently important to warrant the separation of *Atichia* from other *Ascomycetes*. They regard the family as an autonomous type parallel to the filamentous *Ascomycetes*, and they suggest that it represents an abortive offshoot of the *Florideae*.

Conspectus of Species of Atichiaceae.

1. **Phycopsis Vanillae,** *Mang. et Pat.* in Comp. Rend. cliv. p. 1480, fig. 2. *Seuratia Vanillae*, Pat. in Bull Soc. Myc. xxii. p. 54, pl. i., fig. 4. *Atichia Vanillae*, von Höhnel in Ann. Jard. bot. Buitenzorg, 1910, Supp. iii. p. 27 (ex errore *vanillicola*).
Polynesia: Tahiti. On leaves of *Vanilla planifolia*.
Distinguished from *Atichia* by the scattered propagula.

2. **Atichia glomerulosa,** *Stein* in Cohn Crypt. Flora ii. part 2, p. 356; von Höhnel, *l.c.*, p. 19. *Collema glomerulosum*, Ach. Lich. Univ. p. 641. *Synalissa glomerulosa*, Nyl. Enum. Lich. p. 88. *Atichia Mosigii*, Flot. in Linnaea xxiii. p. 150; Millardet in Mem. Soc. sci. nat. Strassb. vi. p. 60, 3 tab. *Hyphodictyon lichenoides*, Millardet in Act. Soc. Helv. 1866, p. 85. *Seuratia pinicola*, Vuilleman in Bull. Soc. Myc. xxi. p. 74, pl. 4.
S. Europe. On leaves and shoots of *Picea* and other conifers.

3. **A. paradoxa,** *von Höhnel, l.c.*, p. 27. *Heterobotrys paradoxa*, Sacc. Michelia ii. p. 124.
France: Rouen. On leaves of *Euonymus japonicus*.
This species is insufficiently known and may be a synonym of the last.

4. **A. Millardeti,** *Rac.* in Bot. Inst. Buitenzorg, 1900, p. 41; in Bull. de l'Acad. Sci. Cracovie, 1909, p. 369; von Höhnel, l.c. p. 27. *Atichiopsis Solmsii*, R. Wagn. in Oestr. Bot. Zeitschr. L. p. 304. *Seuratia coffeicola*, Pat. in Bull. Soc. Myc. xx. p. 136, fig. 1; *ibid.*, xxii. p. 53; Mang. et Pat. in Comp. Rend. cliv. p. 1477, fig. 1 (cf. *Capnodium stellare*, Bern. in Bull. Dept. Ag. Ind. Néerl. No. xi. pp. 1–24).
Malaya: Java. Polynesia: Gambier Islands and Tahiti. On leaves of *Coffea arabica*, *Styrax Benzoin*, *Cinnamomum zeylanicum* and other plants.
This species is easily distinguished by the three hairs on the triquetrous propagula.

5. **A. Treubii,** *von Höhnel*, l.c. p. 27.
Malaya: Java. On leaves of *Ficus elastica*.
A very minute species and probably easily overlooked.

6. **A. Tonduzi,** comb. nov. *Seuratia Tonduzi*, Mang. et Pat. l.c. p. 1480, fig. 1.
Central America: Costa Rica. On *Anthurium* sp.
A fine large species distinguished by the irregular globose or botryoidal propagula, which may be 30–35 μ across.

7. **A. dominicana**, sp. nov.

West Indies: Dominica. On leaves of *Citrus Medica*.

Distinguished by the small triquetrous propagula devoid of hairs.

8. **A. chilensis**, comb. nov. *Heterobotrys paradoxa*, subsp. *chilensis*, Sacc. et Syd. in Ann. myc. ii. p. 172. *Antennaria scoriadea* Berk., Neger in Bakt. Centr., ii. p. 613 (*p.p., non alibi*).

Chile: Villarica. On leaves of various plants.

Bibliography.

1850. Flotow, J. von. Ueber Collemaceen. Linnea xxiii. pp. 147–172.

1866. Millardet, P. M. A. Sur un Cryptogame nouveau. Actes Soc. Helv. des Sci. Nat. 1866, pp. 85–87.

1870. ——— Mémoire pour servir à l'histoire des Collémacées. Mém. Soc. Sci. Nat. Strassbourg, vi. pp. 60–82.

1900. Wagner, R. Ueber eine neue Ascomycetengattung aus Java. Oest. Bot. Zeitschr. Bd. l. pp. 304–305.

1900. Raciborski, M. Parasitische Algen u. Pilze Javas. Theil iii. Bot. Inst. zu Buitenzorg, 1900, pp. 49.

1904. Patouillard, N. Descriptions des quelques Champignons nouveaux des Iles Gambier. Bull. Soc. Myc. France, xx. pp. 135–138.

1905. Vuilleman, P. Seuratia pinicola sp. nov. Type d'une nouvelle famille d'Ascomycètes. Bull. Soc. Myc. France, xxi. pp. 74–80.

1906. Patouillard, N. Champignons recueillis par M. Seurat dans la Polynésie française. Bull. Soc. Myc. France, xxii. pp. 45–62.

1906. Neger, F. W. Ueber eine neue Fruchtform eines Fumago-ähnlichen Pilzes. Centralbl. f. Bakt. ii. pp. 613–615.

1907. Bernard, C. Notes de Pathologie végétale. Bull. du Départ. de l'Agric. aux Indes Néerl. xi. pp. 1–55, pl. 1–3.

1909. Raciborski, M. Parasitische u. Epiphytische Pilze Javas. Bull. de l'Acad. des Sci. de Cracovie, 1909, pp. 346–394.

1909. Höhnel, F. von. Fragmente zur Mykologie vii. Sitzungsber. Kais. Akad. Wissensch. Wien, Mathem-Naturw. Klasse, cxviii. Abt. 1, pp. 813–904.

1910. ——— Atichia Treubii (Saccharomycetes). Ann. du Jard. Bot. Buitenzorg, ser. ii. suppl. 3, part 1, pp. 19–28.

1912. Mangin, L. et Patouillard, N. Les Atichiales, groupe aberrant d'Ascomycètes inférieurs. Comptes Rendus de l'Acad. des Sciences, cliv. pp. 1475–1481.